# Manitoba **Diabetes** Care Recommendations

Manitoba Health

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Manitoba
**Diabetes**
Care Recommendations

*Balance is an essential factor in diabetes prevention, education, care, research and support. The front cover graphic design reflects the concept of the* ***medicine circle*** *or* ***medicine wheel****, an ancient and powerful symbol of healing and balance. The quadrants of the circle can be interpreted as representing the importance of balance in all aspects of human existence: spiritual, emotional, physical and intellectual.*

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# Background & Introduction

In June 1996, Manitoba's Minister of Health declared diabetes to be a major public health issue and epidemic in Aboriginal people and Seniors (over age 55 years) of all populations. This was based on evidence documented by the Epidemiology and Diabetes & Chronic Diseases Units of Manitoba Health in their ongoing *Diabetes Burden of Illness Study*.

*Diabetes: A Manitoba Strategy* is Manitoba's response to the epidemic of diabetes and was released in November of 1998. The Strategy was the result of a unique intersectoral effort coordinated by a Steering Committee co-chaired by Dr. Emőke Szathmáry, President of the University of Manitoba and Grand Chief George Muswaggon, Grand Chief Francis Flett and Acting Grand Chief Sidney Garrioch of Manitoba Keewatinowi Okimakanak Inc. The principles of population health, health determinants, healthy public policy, evidence-based decision making, holistic approach, learning about health, community participation and effective diabetes services framed the development of the Strategy. The Steering Committee established five Working Groups to address the continuum of Diabetes Prevention, Education, Care, Research and Support.

**A key recommendation from the Care Working Group was:**

Develop **Manitoba Diabetes Care Recommendations** for the care of people with diabetes, consistent with the Canadian Diabetes Association Clinical Practice Guidelines (CMAJ,1998;159(8 Suppl): S1-29).

**The Manitoba Diabetes Care Recommendations** should include:

a) a format that is concise and practical.
b) periodic review and update.
c) collaboration with the College of Physicians and Surgeons of Manitoba and other appropriate regulatory bodies.
d) tools to evaluate the implementation of the recommendations and their effectiveness.
e) a distribution plan for all health professionals and health care providers, as well as appropriate regulatory bodies and professional organizations.

f) information that is relevant to the care of:
   I. Aboriginal people with diabetes. The unique considerations of family-centered care, language and culture must be incorporated in the recommendations.
   II. women of child-bearing age with diabetes and women with, or at risk of developing, gestational diabetes.
   III. children with diabetes and their families. Instruction should be made available to all members of the family. Community-based care should be emphasized for Aboriginal children.
   IV. seniors with diabetes. The recommendations should promote individualized care for seniors with consideration given to individual needs, associated diseases and functional status.

In 1992, the Canadian Diabetes Advisory Board published *Clinical practice guidelines for treatment of diabetes mellitus*. In 1998, these guidelines were revised under the auspices of the Canadian Diabetes Association. The *1998 clinical practice guidelines for the management of diabetes in Canada* was based on the best research evidence available at the time of publication. As new evidence emerges, the Canadian Diabetes Association has a process to incorporate revised recommendations.

The **Manitoba Diabetes Care Recommendations** are an adaptation of the national guidelines, for province-wide use in Manitoba. Additional information has been added to provide practical details in specific areas. The goal of the **Manitoba Diabetes Care Recommendations** is to provide the standards of care for diabetes in the community, in a precise and simple format. Issues beyond the scope of these recommendations should be referred to members of a specialized diabetes health care team. There will also be a process for periodic revision as outlined in the Care Recommendation from *Diabetes: A Manitoba Strategy*.

The **Manitoba Diabetes Care Recommendations** are meant to be used in conjunction with broader diabetes education resources, including the Canadian Diabetes Association *Guidelines for the Nutritional Management of Diabetes Mellitus in the New Millenium* and the *Manitoba Diabetes Education Resource Program Manuals*.

The intended audience for the **Manitoba Diabetes Care Recommendations** includes primary care physicians, diabetes educators and other health care professionals and providers.

# Prevention

## Classification

In 1997, the American Diabetes Association (ADA) and the World Health Organization (WHO) agreed on a new classification system for diabetes mellitus that is based on the underlying cause of diabetes rather than the treatment.

The previous classification terms, IDDM and NIDDM, have been discarded as the use of insulin does not determine the type of diabetes. Arabic numerals (1,2) have replaced Roman numerals (I, II).

## Type 1 Diabetes

- Pancreatic beta cell destruction that usually leads to absolute insulin deficiency
- Prone to diabetic ketoacidosis
- Auto-immune mediated

## Type 2 Diabetes

- Ranges from predominantly insulin resistance with relative insulin deficiency to predominantly insulin secretory defect with insulin resistance
- Not prone to diabetic ketoacidosis

## Gestational Diabetes Mellitus

- Onset of glucose intolerance in pregnancy

## Other

- Genetic defects of pancreatic beta cell function
- Genetic defects in insulin action
- Associated genetic disorders
- Drug-induced e.g. corticosteroid-induced
- Disease of the endocrine pancreas
- Endocrine disorders known to cause diabetes

## Diagnosis

| DIAGNOSTIC CRITERIA for DIABETES | |
|---|---|
| In the presence of classical symptoms of diabetes:thirst, frequent urination, blurred vision, fatigue or weight loss | Casual plasma glucose (PG) ≥ 11.1 mmol/L |
| Fasting Plasma Glucose (FPG) | Fasting Plasma Glucose ≥ 7.0 mmol/L |
| 75 gram Oral Glucose Tolerance Test (OGTT) | 2 hour glucose value ≥ 11.1 mmol/L |

| BLOOD GLUCOSE VALUES for the DIAGNOSIS of DIABETES and GLUCOSE INTOLERANCE | | | |
|---|---|---|---|
| **CATEGORY** | **FPG (mmol/L)** | Plasma Glucose (mmol/L): 1 hour post 75 gram glucose load | Plasma Glucose (mmol/L): 2 hours post 75 gram glucose load |
| Impaired Fasting Glucose (IFG) | 6.1-6.9 | N/A | N/A |
| Impaired Glucose Tolerance (IGT) | <7.0 | N/A | 7.8-11.0 |
| Diabetes Mellitus | ≥ 7.0 | N/A | ≥ 11.1 |

The **FPG is the preferred test** as a FPG of 7.0 mmol/L and a 2 hour PG of 11.1 mmol/L represent threshold values for micro and macrovascular complications. The OGTT will rarely be needed to make the diagnosis.

A confirmatory test should be done on a separate day. This second test is not necessary for the diagnosis of diabetes in children or adults with classical symptoms, as metabolic decompensation may occur quickly. Hemoglobin A1c is not recommended as a test for diagnosis.

IFG is a new term which identifies another stage of abnormal glucose tolerance where the risk of development of Type 2 diabetes is increased. IFG may also be associated with an increased risk of cardiovascular disease. Both IGT and IFG indicate a need for annual screening.

## Screening and Risk Factor Assessment for Type 2 Diabetes

Individuals at risk for Type 2 diabetes should be screened. This will ensure earlier diagnosis and intervention.

### Guidelines for Screening

Screening for Type 2 diabetes in individuals without risk factors is recommended every 3 years, beginning at age 45. Individuals with risk factors should be screened annually, beginning at an earlier age.

### Risk Factors

- First degree relative with Type 2 diabetes
- Member of a high risk population (e.g. Aboriginal people, Hispanic, Asian and African descent). In Manitoba, Aboriginal people, including children over age 6, represent a population at greatest risk for Type 2 diabetes. Therefore, all Aboriginal people should be screened annually from age 7 onwards.
- Obesity: Body Mass Index (BMI) $\geq 30$ kg/m$^2$
- Low level of high-density lipoprotein cholesterol (HDL), < 0.9 mmol/L, or an elevated level of triglycerides (TG), > 2.8 mmol/L
- History of IGT or IFG
- History of gestational diabetes (GDM) or baby with birth weight over 4 kg
- Presence of hypertension (≥140/90 mm/Hg)
- Presence of cardiovascular disease

The recommended screening test is a Fasting Plasma Glucose (FPG), using a fasting venous sample.

Capillary screening with a glucose meter is acceptable when:

- trained individuals are performing the screening, and
- a quality assurance program is in place to monitor the accuracy of results.

**A Fasting Plasma or Fasting Capillary Glucose ≥ 7.0 mmol/L is positive for diabetes. A confirmatory test should be done on a separate day utilizing a fasting venous sample.**

**This second test is not necessary for the diagnosis of diabetes in children or adults with classical symptoms, as metabolic decompensation may occur quickly.**

### Risk Factor Assessment

There are specific risk factors that should be assessed when screening occurs for Type 2 diabetes. These include modifiable factors that contribute to the overall risk of long term complications, particularly cardiovascular disease.

These risk factors include:

- Blood pressure (BP)
- BMI
- Lipid profile
- Smoking

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- BMI
- Lipid profile
- Smoking

## Screening for Gestational Diabetes

All pregnant women should be screened for gestational diabetes at 24-28 weeks gestation with the exception of those women at low risk. Low risk women include Caucasian women < 25 years of age with no personal or family history of diabetes and no history of large babies.

## Risk Factors

- Increased maternal age
- Family history of diabetes
- Identified high risk ethnic groups including Aboriginal, Hispanic, Asian and Afro-Canadian
- Pre-pregnancy obesity
- Excess weight gain in current pregnancy
- Previous large infant (4000 g or 90th percentile for gestational age)
- Previous unexplained stillbirths or congenital malformations

If a risk factor is identified **during** the pregnancy, proceed with screening at that time. If the screen is negative, but risk factors persist, repeat the screening at 24-28 weeks gestation.

**The preferred screening test is a 50 gram oral glucose load, given at any time of day, followed by a plasma glucose at 1 hour.**

- **If the 1 hour value ≥ 7.8 mmol/L, proceed to the OGTT.**
- **If the 1 hour value ≥10.3 mmol/L, the diagnosis of gestational diabetes can be made.**

## Diagnosis

| ORAL GLUCOSE TOLERANCE TEST (2 HOUR 75 GRAM) | |
|---|---|
| Fasting | > 5.3 mmol/L |
| 1 hour | > 10.6 mmol/L |
| 2 hour | > 8.9 mmol/L |

If **2 or more values** are exceeded, the diagnosis is **Gestational Diabetes.**
If 1 value is exceeded, the diagnosis is **Impaired Glucose Tolerance of Pregnancy**.

**Impaired Glucose Tolerance of Pregnancy (IGT of Pregnancy)** is carbohydrate intolerance in pregnancy and should not be confused with IGT in the non-pregnant person.

IGT of pregnancy carries some of the same implications as does GDM and therefore should be treated in the same fashion.

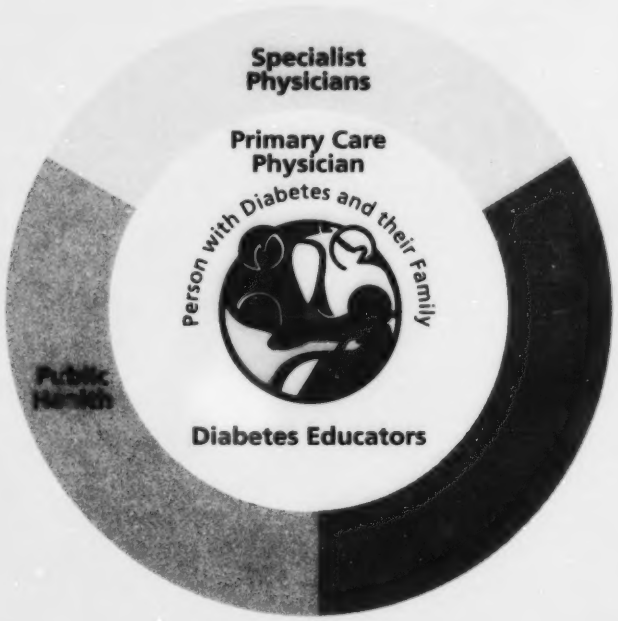
# Education

## Diabetes Health Care Team

Diabetes care requires the daily commitment of the person with diabetes to balance appropriate lifestyle choices and pharmacologic therapy, through the acquisition of specific self-management diabetes knowledge and skills. Initial and ongoing diabetes education for the person with diabetes and his or her family should be considered an integral part of diabetes care. This requires the support of a multidisciplinary team of diabetes health care professionals and providers. The Diabetes Health Care (DHC) team is the structure that provides this support.

Central to the DHC team is the person with diabetes and his or her family. Also central to this team is the primary care physician and/or a diabetes specialist as well as the team of community-based diabetes educators and diabetes health care providers. All children with Type 1 diabetes and their families should be referred to the DHC team for children and adolescents in Winnipeg.

When required, the DHC team may be expanded to include other health care and community service specialists and providers. The DHC team should provide comprehensive, shared care that facilitates ongoing participation and communication amongst all its members.



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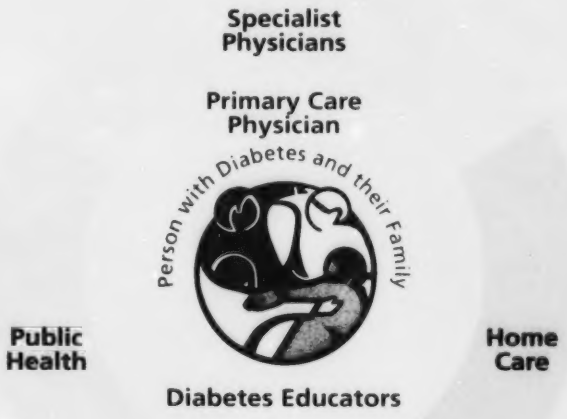

## Target Blood Glucose and Glycated Hemoglobin Levels

| TARGET BLOOD GLUCOSE and GLYCATED HEMOGLOBIN LEVELS for ADULTS | | | | |
|---|---|---|---|---|
| | **IDEAL** | **OPTIMAL[1]** | **SUBOPTIMAL[2]** | **INADEQUATE[3]** |
| | Normal Non-diabetic | Target Goals | Action May Be Required | Action Required |
| Hemoglobin A1c (% of upper limit) | <100% | <115% | 116-140% | >140% |
| Hemoglobin A1c (Hgb A1c) | 4-6% | <7% | 7.0-8.4% | >8.4% |
| Fasting or Pre-meal (ac meals) glucose | 3.8-6.1 | 4-7 | 7.1-10 | >10 |
| 1-2 hour Post-meal (pc meals) glucose | 4.4-7 | 5.0-11 | 11.1-14 | >14 |

[1] These levels correlate to minimal risk of chronic complications but may be difficult to achieve without an increased risk of hypoglycemia.

[2] Suboptimal levels should be attainable in the majority of people with diabetes but may not be adequate to avoid or prevent complications. In certain groups, e.g. young children, the frail elderly and individuals with significant diabetes-related or other disease states, these levels do not require action as the subsequent risk of hypoglycemia is too great.

[3] These levels correlate to a markedly increased risk of chronic complications, requiring a reassessment and adjustment of therapy.

| TARGET BLOOD GLUCOSE and GLYCATED HEMOGLOBIN LEVELS for CHILDREN and ADOLESCENTS | | | |
|---|---|---|---|
| **Age** | **Premeal Glucose** | **Bedtime Glucose** | **Hgb A1C** |
| 0-5 yrs | 6-12 mmol/L | 6-12 mmol/L | less than 8.4% |
| 6-12 yrs | 4-10 | 6-12 | less than 7.8% |
| 13-18 yrs and those with Type 2 diabetes | 4-7 | 6-10 | less than 7.0% |

| TARGET BLOOD GLUCOSE LEVELS for PREGNANCY and GESTATIONAL DIABETES | |
|---|---|
| **Fasting** | 3.8-5.3 mmol/L |
| **Post prandial** | 1 hr < 7.8 mmol/L<br>2 hr < 6.7 mmol/L |

## Target Blood Glucose and Glycated Hemoglobin Levels

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| 13-18 yrs and those with Type 2 diabetes | 4-7 | 6-10 | less than 7.0% |

| TARGET BLOOD GLUCOSE LEVELS for PREGNANCY and GESTATIONAL DIABETES | |
|---|---|
| **Fasting** | 3.8-5.3 mmol/L |
| **Post prandial** | 1 hr < 7.8 mmol/L<br>2 hr < 6.7 mmol/L |

# Care

## Clinical Assessment

### History

**Current status**

- Time of onset and progression of symptoms of diabetes, i.e. thirst, urinary frequency, blurred vision, weight loss, infections of the urinary tract, skin or vaginal areas
- Presence of symptoms of diabetes-related complications including eye, kidney, cardiovascular, cerebrovascular and peripheral vascular function, nerve function, hypoglycemia unawareness, skin and foot problems

**Diabetes Assessment**

- Previous diabetes education
- Self Blood Glucose Monitoring (SBGM)
  - Current records
  - Frequency
  - Lab/meter correlation
- Eating habits including meal/snack frequency and composition, food choices and weight history
- Level of physical activity
- Diabetes Medications
  - Oral agents
  - Insulin dosage, adjustment and algorithms
- Health determinants including family and/or other supports, education, employment and health beliefs

**Diabetes Complication Risk Factor Assessment**

- Review of previous
  - Hgb A1c
  - BP
  - BMI
  - Lipid profile
  - Microalbuminuria screen
  - Monofilament assessment of feet
  - Retinopathy screen

**Past History**

- Gestational diabetes
- Cardiovascular (CVD), cerebrovascular (CVA) and/or peripheral vascular disease (PVD)
- Conditions requiring long term corticosteroid use (as a cause of diabetes)
- Pancreatic disease (as a cause of diabetes)

**Family History**

- Diabetes
- Cardiovascular disease
- Hypertension
- Dyslipidemia
- Autoimmune disease (Type 1 diabetes)

**Medications**

- All prescription and non-prescription medications
- Alcohol
- Allergies

## Physical Exam

### General
- BMI: kg/m²
- BP

### Head & Neck
- Eyes
  - Cataracts
  - Fundoscopic exam (does not replace retinal assessment through dilated pupils by experienced examiner)
- Teeth and gums
- Thyroid

### Cardiovascular & Peripheral Vascular Exam
- BP
- Presence of signs of congestive heart failure
- Peripheral pulses, bruits

### Skin
- Injection sites
- Signs of dyslipidemias
- Infections

### Foot Exam
- Screening for vascular integrity
  - Colour
  - Skin and nail condition
  - Peripheral pulses
  - Presence of infection or ulceration
- Screening for peripheral neuropathy
  - Semmes-Weinstein monofilament assessment
  - Presence of vibration or proprioception senses
  - Presence of ankle reflexes

## Investigations

### Glycemic Control
- Hgb A1c

### Complication Risk Factor Assessment
- Baseline serum electrolytes, creatinine and liver function tests in adults
- Fasting lipid profile in adults
- TSH
- Microalbuminuria screen
- Retinal exam through dilated pupils by experienced examiner
- Resting electrocardiogram (ECG) or exercise ECG (if appropriate) for adults >35 years

## CLINICAL DIABETES ASSESSMENT FLOW CHART

| | Initial Assessment | Routine Follow-up (2-4 months) | Annually |
|---|---|---|---|
| **Clinical Assessment** | • Complete history & physical exam including diabetes assessment | Diabetes assessment including:<br>• Review of cardiovascular risk factors<br>• Medication review<br>• BMI<br>• BP<br>• Foot exam as indicated<br>• Neurological assessment as indicated | Update diabetes assessment including:<br>• Review of cardiovascular risk factors<br>• Medication review<br>• BMI<br>• BP<br>• Foot exam<br>• Neurological assessment as indicated |
| **Investigations for Glycemic Control** | • Hgb A1c | • SBGM records<br>• Hgb A1c | • Lab/meter correlation |
| **Investigations for Complication Risk Factor Assessment** | • Baseline serum electrolytes, creatinine, liver function tests in adults<br>• Fasting lipid profile in adults<br>• TSH<br>• Microalbuminuria screen<br>• Retinal exam<br>• Resting (or exercise) ECG for adults >35 yrs | Monitor:<br>• Serum electrolytes, creatinine, liver function tests as indicated<br>• Fasting lipid profile as indicated | • Retinal assessment through dilated pupils as indicated<br>• Microalbuminuria screen (in the absence of microalbuminuria or overt nephropathy)<br>• 24 hr urine for creatinine clearance and protein (in the presence of microalbuminuria or overt nephropathy) |
| **Diabetes Care Plan** | • Determination of individual target blood glucose goals<br>• Diabetes Education<br>• Glycemic control/ complication monitoring and interventions | • Progress towards individual target blood glucose goals<br>• Diabetes Education<br>• Glycemic control/ complication monitoring and interventions | • Progress towards individual target blood glucose goals<br>• Diabetes Education<br>• Glycemic control/ complication monitoring and interventions |

# Oral Antihyperglycemic Agents

## Guidelines For Use

Oral antihyperglycemic agents (oral agents) are one component of management for Type 2 diabetes. The diabetes care plan must begin with and continually emphasize the key principles of healthy eating and increased physical activity.

Oral agents are introduced when glucose targets have not been attained despite achievement of lifestyle changes. In the presence of consistent hyperglycemia (FPG > 10 mmol/L), Metformin is generally the oral agent of first choice.

Oral Agents

- may be used singly or in combination.
- may be used in combination with insulin, usually in conjunction with bedtime intermediate-acting insulin (NPH).

Individual blood glucose targets should be determined by the person with diabetes and their DHC team and assessed regularly.

## Contraindications

- Type 1 diabetes.
- Metformin for those individuals with existing renal or hepatic impairment, or significant congestive heart failure.
- Women of childbearing age (oral agents are possibly teratogenic).
- Children <18 years with Type 2 diabetes is a relative contraindication, as no studies indicating safety or efficacy have been reported in this age group.

## Oral Agents and Seniors

Risk of hypoglycemia and drug interactions must be considered. Gliclazide may be preferable to Glyburide as it is associated with less risk of hypoglycemia. Glyburide often is the cause of significant hypoglycemia.

Start with a low dose and increase slowly. Side effects of medications may be much more debilitating in an older person.

| ORAL ANTIHYPERGLYCEMIC AGENTS | | | | | |
|---|---|---|---|---|---|
| **Oral Agent** | **Mechanism of Action** | **Dosage** | **Action Time** | **Benefits** | **Disadvantages** |
| **Biguanides** | | | | | |
| **Metformin** | Reduces hepatic glucose output | • Start 250-500 mg bid ac meals<br>• Start with low dose and increase slowly<br>• Maximum dose 2550 mg/day in divided doses | 8 hrs | • Does not promote weight gain<br>• Rarely causes hypoglycemia | GI:<br>• nausea<br>• bloating<br>• diarrhea<br>Slow increase in dose decreases these side effects<br>**Contraindicated with renal or hepatic impairment, or CHF** |
| **Sulfonylureas** | | | | | |
| **Glyburide** | Stimulates pancreatic secretion of insulin | • Start 2.5-5 mg od or bid ac meals<br>• Maximum dose 10 mg bid | 16-24 hrs | | • Promotes weight gain<br>• May cause hypoglycemia |
| **Gliclazide** | as above | • Start 80 mg od<br>• Maximum dose 160 mg bid | 8-16 hrs | Causes less hypoglycemia than glyburide, therefore of benefit in seniors | More expensive than glyburide |

## ORAL ANTIHYPERGLYCEMIC AGENTS

| Oral Agent | Mechanism of Action | Dosage | Action Time | Benefits | Disadvantages |
|---|---|---|---|---|---|
| **Alpha 1 Glucosidase Inhibitors** | | | | | |
| **Acarbose** | • Inhibits glucosidase enzymes in carbohydrate digestion<br>• Decreases post-prandial glucose rise | • Start 25 mg with first bite of food<br>• Titrate weekly to usual dose of 50-100 mg/meal | Best effect seen post-prandially | No hypoglycemia if used alone | • GI: bloating, flatus<br>• Start with low dose and increase slowly!<br>• "Beano" counteracts action |
| **Meglitinides** | | | | | |
| **Repaglinide** | • Stimulates pancreatic insulin secretion<br>• Different mechanism from sulfonylureas | • Start 0.5 mg taken 0-30 min before each meal<br>• Dosages available as 0.5,1, 2 mg | Short-acting; stimulates insulin secretion in response to glucose rise at meal time | • Controls post-prandial glucose rise<br>• Provides flexibility to fit varied meal-times | • May cause hypoglycemia |
| **Thiazolidinediones** | | | | | |
| **Troglitazone** | • Insulin sensitizer<br>• Insulin action improved in liver, muscle and adipose tissue | • Start 200 mg/day with meal with insulin<br>• Usual dose 400 mg/day | Enhances effect of circulating insulin | **WITHDRAWN FROM MARKET (MARCH 2000)** | • Headache<br>• Nausea and diarrhea<br>• Rarely may cause increased liver enzymes and very rarely dysfunctional liver<br>• **Regular monitoring of liver function is required** |
| **Rosiglitazone** | • Insulin sensitizer<br>• Insulin action improved in liver, muscle and adipose tissue | • 4-8 mg daily | Enhances effect of circulating insulin | **AVAILABLE IN CANADA (MARCH 2000)** | • **Studies thus far indicate it may not cause liver dysfunction** |

# Insulin

## Guidelines For Use

### Type 1 Diabetes

Insulin is essential for people with Type 1 diabetes and should be initiated at the time of diagnosis. Referral to a specialized DHC team is recommended for children and adolescents.

### Type 2 Diabetes

Insulin may be very effective in improving glycemic control in people with Type 2 diabetes who have not achieved target blood glucose levels through lifestyle changes and/or oral antihyperglycemic agents.

### Gestational Diabetes

Most women with GDM will be able to maintain target blood glucose levels through lifestyle changes including healthy eating habits and regular physical activity. For those women unable to maintain target blood glucose levels, insulin will be required for the duration of the pregnancy. It can be stopped immediately after delivery.

### Type 1 and Type 2 Diabetes in Pregnancy

Women using insulin prior to pregnancy may find that their insulin requirements decrease in the first trimester. By the end of the second trimester (28 weeks), insulin requirements usually increase. After delivery, insulin needs will immediately revert to pre-pregnancy requirements. Oral antihyperglycemic agents are not recommended for women planning a pregnancy or during pregnancy. Lispro insulin is now approved for use during pregnancy.

## Insulin Initiation

- Insulin can be started on an outpatient basis.
- Diabetes education and support is necessary. Close contact between the DHC team and the person starting insulin is needed to review the impact of food intake, insulin injection technique, SBGM interpretation, dosage adjustments and problem solving.
- Several regimens are possible. All regimens need to be individualized to the person with diabetes.
- At this time, insulin pump therapy (continuous subcutaneous insulin infusion or CSII) should be initiated by a DHC team involving a diabetes specialist.
- The total daily requirement of insulin will generally range from 0.5-1.0 units/kg in divided doses.
- The general recommendation is to start slowly with 0.2-0.3 units/kg per day. In certain situations, the starting dose should be lower (0.1-0.2 units/kg per day). For example, when planning to combine insulin (NPH at hs) with oral agents during the day.

| INSULIN TYPES | | | | |
|---|---|---|---|---|
| **Type** | **Trade Name** | **Onset (hrs)** | **Peak (hrs)** | **Duration (hrs)** |
| **Rapid-Acting Insulin Analogue** | | | | |
| LISPRO (H) | Humalog | 0.1 hrs | 1.5 hrs | 3.0 hrs |
| **Short Acting** | | | | |
| REGULAR (R) | Humulin R<br>Novolin ge Toronto | 0.2 | 3-4 | 6-8 |
| **Intermediate Acting** | | | | |
| NPH (N) | Humulin N<br>Novolin ge NPH | 1.5 -2 | 4-12 | 18-24 |
| Lente (L) | Humulin L<br>Novolin ge L | 1.5 -2 | 4-12 | 18-24 |
| **Premixed (Short/Intermediate Acting, R/NPH)** | | | | |
| 10/90<br>20/80 | Humulin<br>Novolin ge | 0.5 | 2-12 | 18-24 |
| 30/70<br>40/60 | | | 2-3 | 10-14 |
| 50/50 | | | 1 | 10-14 |
| **Pre-mixed Insulin Analogue** | | | | |
| 25% Lispro and 75% NPL<br>NPL is Lispro formulated to produce action similar to NPH | Mix 25 | 15 minutes (Lispro portion) | 1 hour | 10-14 (NPL portion, similar to NPH) |
| **Long Acting** | | | | |
| ULTRA LENTE (U) | Humulin U<br>Novolin ge UltraLente | 4-6 | 10-24 | 36 |

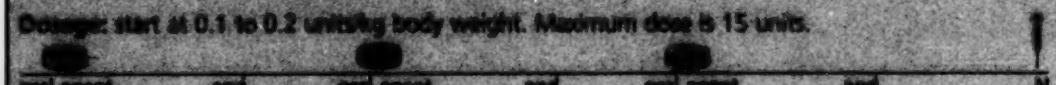
## Insulin Regimens

### INSULIN AND ORAL AGENTS

N at hs and oral agents during the day.

**Indications:** Type 2 diabetes, when optimal control is not desired, to lower fasting glucose levels < 10 mmol/L and to allow oral agents to have optimal effect.

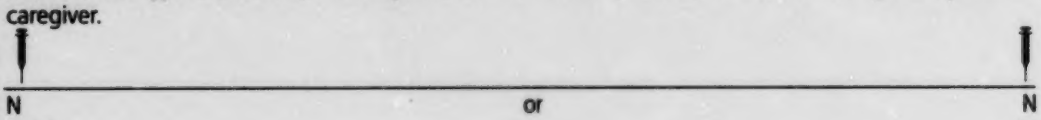
**Dosage:** start at 0.1 to 0.2 units/kg body weight. Maximum dose is 15 units.




### SINGLE DOSE Once Daily

N once daily either amac or hs.

**Indications:** Type 2 diabetes, when optimal control is not desired or when insulin is given by external caregiver.

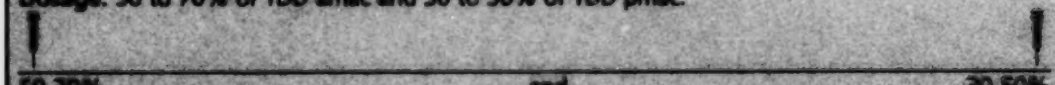



### SINGLE DOSE BID (Split Dose)

N twice daily amac and pmac.

**Indications:** Type 2 diabetes, when optimal control is not desired.

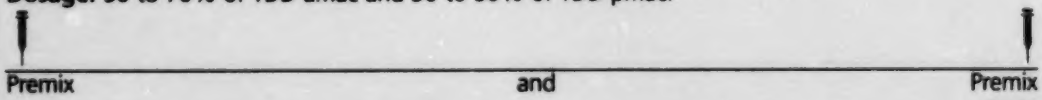
**Dosage:** 50 to 70% of TDD amac and 30 to 50% of TDD pmac.




### PREMIX BID

**Indications:** Type 2 diabetes, when optimal control is not desired and for those with difficulty mixing insulins. The disadvantage is that specificity in dosage adjustment is lost and a change in dose affects both insulins.

**Dosage:** 50 to 70% of TDD amac and 30 to 50% of TDD pmac.




| | | | |
|---|---|---|---|
| **LEGEND:** | amac - before breakfast | pmac - before supper | hs - bedtime |
| | R - Regular insulin | H - Lispro insulin | U - Ultralente insulin |
| | N - NPH insulin | L - Lente insulin | TDD - total daily dose |
| | BID - twice daily | TID - three times daily | QID - four times daily |

## Insulin Regimens

### INSULIN AND ORAL AGENTS

N at hs and oral agents during the day.

**Indications:** Type 2 diabetes, when optimal control is not desired, to lower fasting glucose levels < 10 mmol/L and to allow oral agents to have optimal effect.

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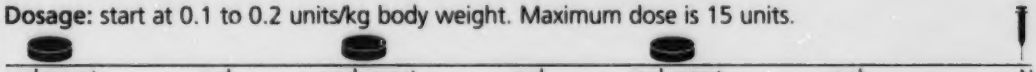


### SINGLE DOSE: Once Daily

N once daily either amac or hs.

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N twice daily amac and pmac.

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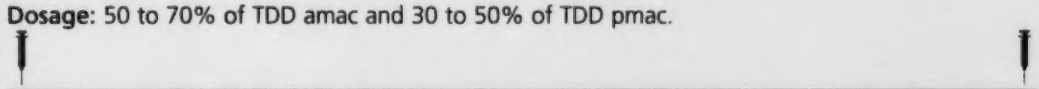


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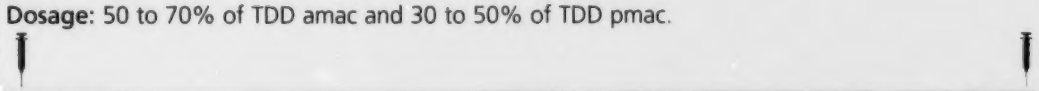


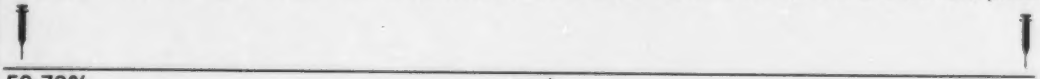

| **LEGEND:** | | | |
|---|---|---|---|
| | amac - before breakfast | pmac - before supper | hs - bedtime |
| | R - Regular insulin | H - Lispro insulin | U - Ultralente insulin |
| | N - NPH insulin | L - Lente insulin | TDD - total daily dose |
| | BID - twice daily | TID - three times daily | QID - four times daily |

## SPLIT/MIXED DOSE: BID

N and short-acting (R or H) twice daily.

**Indications:** Either Type 1 or Type 2 diabetes; may provide satisfactory and sometimes optimal control.

**Dosage:** 50 to 70% of TDD (2/3 N and 1/3 R/H) amac and 30 to 50% of TDD (2/3 N and 1/3 R/H) pmac.

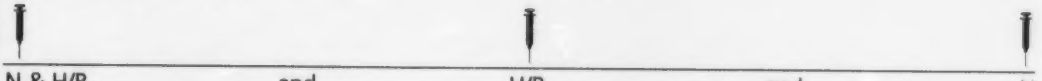



## MULTIPLE DOSE INSULIN THERAPY (MDI): TID

N amac and hs with H or R amac and pmac. This regimen requires close contact with the DHC team.

**Indications:** Either Type 1 or Type 2 diabetes, when optimal control is desired. Hs insulin is used to prevent early morning hyperglycemia.

**Dosage:** 50 to 70% of TDD (2/3 N and 1/3 H/R) amac and 15 to 25% of TDD (H/R) pmac and 15 to 25% of TDD (N) at hs.




## MULTIPLE DOSE INSULIN THERAPY (MDI): QID

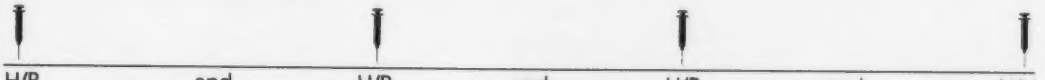
MDI best mimics physiological insulin release and allows the most flexibility. This regimen requires close contact with the DHC team.

Either N *or* U at hs with short-acting (H or R) before meals.

Occasionally N is given pmac, BID amac and pmac or BID amac and hs (depending on glucose control).

**Indications:** Either Type 1 or Type 2 diabetes; for optimal control and for those motivated to monitor diabetes intensively.

**Dosage:** N/U 40 to 50% of TDD at hs. Balance given as premeal H or R (15 to 25% amac, 10 to 15% before lunch and 15 to 20% pmac).




**OR**

**Dosage:** N 45 to 55% of TDD given BID (amac and pmac or hs). Balance given as premeal H or R (15 to 25% amac and 15 to 20% pmac).

## SPLIT/MIXED DOSE: BID

N and short-acting (R or H) twice daily.

**Indications:** Either Type 1 or Type 2 diabetes; may provide satisfactory and sometimes optimal control.

**Dosage:** 50 to 70% of TDD (2/3 N and 1/3 R/H) amac and 30 to 50% of TDD (2/3 N and 1/3 R/H) pmac.

| 50-70%<br>2/3 N, 1/3 R/H<br>amac | and | 30-50%<br>2/3 N, 1/3 R/H<br>pmac |
|---|---|---|

## MULTIPLE DOSE INSULIN THERAPY (MDI): TID

N amac and hs with H or R amac and pmac. This regimen requires close contact with the DHC team.

**Indications:** Either Type 1 or Type 2 diabetes, when optimal control is desired. Hs insulin is used to prevent early morning hyperglycemia.

**Dosage:** 50 to 70% of TDD (2/3 N and 1/3 H/R) amac and 15 to 25% of TDD (H/R) pmac and 15 to 25% of TDD (N) at hs.

| N & H/R<br>amac | and | H/R<br>pmac | and | N<br>hs |
|---|---|---|---|---|

## MULTIPLE DOSE INSULIN THERAPY (MDI): QID

MDI best mimics physiological insulin release and allows the most flexibility. This regimen requires close contact with the DHC team.

Either N *or* U at hs with short-acting (H or R) before meals.

Occasionally N is given pmac, BID amac and pmac or BID amac and hs (depending on glucose control).

**Indications:** Either Type 1 or Type 2 diabetes; for optimal control and for those motivated to monitor diabetes intensively.

**Dosage:** N/U 40 to 50% of TDD at hs. Balance given as premeal H or R (15 to 25% amac, 10 to 15% before lunch and 15 to 20% pmac).

| H/R<br>amac | and | H/R<br>lunch | and | H/R<br>pmac | and | N/U<br>hs |
|---|---|---|---|---|---|---|

**OR**

**Dosage:** N 45 to 55% of TDD given BID (amac and pmac or hs). Balance given as premeal H or R (15 to 25% amac and 15 to 20% pmac).

| H/R & N<br>amac | and | H/R & N<br>pmac | or | N<br>hs |
|---|---|---|---|---|

## Insulin Therapy for Adults

### Establishing Baseline Insulin Dose

- Intermediate or long-acting insulin; adjust no more than 1-2 units every 48 hours and reassess according to SBGM results.
- Short-acting insulin; adjust no more than 1-2 units every 24 hours and reassess according to SBGM results.

### Daily Insulin Adjustment

- Adjusting insulin must be balanced with adjusting carbohydrate intake and/or physical activity.
- Increase the Regular insulin by 1-2 units for every 3-4 mmol/L blood glucose beyond the target blood glucose range. Generally, individual Regular insulin dosages can be increased to a maximum of 10% of the total daily dose, at any usual dosage time, for high blood glucose levels.
- Likewise, the same adjustment can be used to decrease insulin dosages as necessary.

## Insulin Therapy for Children with Type 1 Diabetes

- A TID insulin regimen is recommended for children, adolescents and young adults with Type 1 diabetes from the time of diagnosis.
- Total daily requirements are usually 0.6-0.9 units/kg per day. The general recommendation is to start slowly with 0.3-0.5 units/kg per day.
- Two thirds of the total daily dose is injected amac, 1/6 of the total daily dose is injected pmac and 1/6 of the total daily dose is injected at hs.
- Two thirds of the amac dose is intermediate acting insulin (NPH) and 1/3 is short-acting insulin (Lispro or Regular). The pmac dose is Lispro or Regular and the hs dose is NPH insulin.
- Insulin dosage adjustments need to be made daily during the first 2 weeks following diagnosis.
- For young children, Lispro may be given after the meal, thus allowing the dosage to be adjusted for what the child actually eats.
- Insulin requirements will decrease 1-2 months after diagnosis, when weight is regained, appetite decreases and insulin secretion recovers temporarily (honeymoon phase).

## MDI Insulin Algorithm

MDI (TID/QID) with Lispro/Regular requires a specific insulin algorithm for premeal adjustment above or below baseline insulin dose as shown in the following example.

| Pre-meal blood glucose reading (mmol/L) | Lispro/Regular dosage adjustment (units) |
|---|---|
| < 4 | -1 |
| 4-7 | Baseline |
| 7-8 | +1 |
| 8-11 | +2 |
| 11-14 | +3 |
| 14-16 | +4 |
| > 16 | +5 |

All insulin algorithms must be individualized to suit the person with diabetes, their lifestyle and their individual response to insulin dosage adjustment. The maximum additional Lipso/Regular insulin is generally 10% of the total daily requirement. **Lispro dosages should be decreased by 50% for exercise.**

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All insulin algorithms must be individualized to suit the person with diabetes, their lifestyle and their individual response to insulin dosage adjustment. The maximum additional Lipso/Regular insulin is generally 10% of the total daily requirement. **Lispro dosages should be decreased by 50% for exercise.**

Manitoba
Care
Recommendations

# Retinopathy

Manitoba
**Diabetes**
Care Recommendations

## Retinopathy

### Guidelines for Screening

- Type 1 diabetes: eyes should be examined at 15 years of age or within 5 years of diagnosis.
- Type 2 diabetes: eyes should be examined at diagnosis (or after puberty).
- Retinopathy screening should be performed by an ophthalmologist, optometrist or physician experienced with assessment of diabetic changes, through dilated pupils.
- The interval for follow-up for those individuals with no or minimal retinopathy is 2-4 years.
- Pregnancy: eye examinations should be carried out on women with diabetes who are pregnant or planning a pregnancy.

**People with macular edema, moderate to severe non proliferative retinopathy or proliferative retinopathy require the prompt care of an ophthalmologist experienced in the management of diabetic retinopathy (retinal specialist).**

Manitoba
Care
Recommendations

Nephropathy & Hypertension

# Nephropathy Hypertension

Manitoba
**Diabetes**
Care Recommendations

# Nephropathy and Hypertension

## Frequency

### Screening for Nephropathy

- Type 1 diabetes: at 15 years of age or 5 years after the onset of diabetes. Continue screening annually.
- Type 2 diabetes: at the time of diagnosis. Continue screening annually.
- Pregnancy: Women should be evaluated at the beginning of pregnancy. Those women with nephropathy should be followed carefully as diabetic nephropathy may progress during pregnancy.

| SCREENING FLOWCHART | |
|---|---|
| **1. DIPSTICK URINALYSIS** | |
| **NEGATIVE** ↓ If negative or trace for protein, then screen for microalbuminuria annually as described below ↓ **MICROALBUMINURIA SCREEN** | **POSITIVE (greater than trace)** ↓ If positive for protein, this implies the presence of overt nephropathy. Proceed to quantitative 24 hour urinary protein plus baseline creatinine clearance ↓ **24 HOUR URINE FOR PROTEIN AND CREATININE CLEARANCE** |
| **2. MICROALBUMINURIA SCREEN** | |
| **Recommended screening test**<br>Random urine for albumin to creatinine ratio<br>Positive: > 2.0 mg/mmol for males<br>> 2.8 mg/mmol for females | |
| **OPTIONS FOR MICROALBUMINURIA SCREEN** | |
| 2.1 Microalbumin Dipstick Kit<br>If reading > 1, proceed to 24 hr urinary collection. | 2.2 Timed urine 12 hr overnight or 24 hr collection for albumin:<br>• Microalbuminuria 30-299 mg/24 hrs<br>• Overt nephropathy > 300 mg/24 hrs |

### Nephropathy Screening Follow-up

**If microalbuminuria screen is negative, repeat screening test annually.**

**If microalbuminuria screen is positive, confirm results by:**

- **Repeat albumin/creatinine ratio 2-3 x over 3 months. Consistently positive results confirm microalbuminuria.**
- **A timed** urine for albumin, 12 hour overnight or 24 hour collection. One positive timed collection confirms microalbuminuria.
- In adolescents, the preferred confirmation test is a first morning urine sample for albumin/creatinine ratio or a 12 hour overnight urine collection because of the high frequency of postural albuminuria in normal individuals in this age group.

# Nephropathy and Hypertension

## Frequency

### Screening for Nephropathy

- Type 1 diabetes: at 15 years of age or 5 years after the onset of diabetes. Continue screening annually.
- Type 2 diabetes: at the time of diagnosis. Continue screening annually.
- Pregnancy: Women should be evaluated at the beginning of pregnancy. Those women with nephropathy should be followed carefully as diabetic nephropathy may progress during pregnancy.

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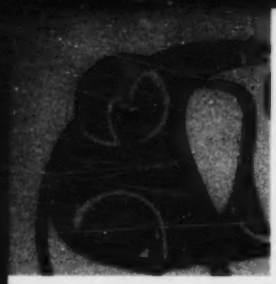
| FACTORS AFFECTING MICROALBUMINURIA SCREEN | |
|---|---|
| **False Positive** | **False Negative** |
| • Exercise within previous 24 hours<br>• Physiological orthostatic proteinuria<br>• Short term marked hyperglycemia<br>• Urinary tract infection<br>• Uncontrolled hypertension | • ACE Inhibitors<br>• Malnutrition<br>• Non steroidal anti-inflammatory drugs<br>• Congestive heart failure<br>• Acute febrile illness |

| INTERVENTION for MICROALBUMINURIA and/or OVERT NEPHROPATHY | |
|---|---|
| 1. Management of hypertension<br>**This is the most important aspect of the intervention for microalbuminuria or overt nephropathy.** | • Hypertension in adults with diabetes (BP ≥ 140/90 mmHg) should be treated to achieve a target BP < 130/80 mmHg |
| 2. ACE inhibitors for kidney protective effect | • For adults with Type 1 diabetes and microalbuminuria, ACE inhibitors should be used even in the absence of hypertension<br>• Adults with Type 2 diabetes and microalbuminuria will likely benefit from ACE inhibitors even in the absence of hypertension<br>• Individuals with overt nephropathy, either Type 1 or Type 2 diabetes, should be treated with ACE inhibitors |
| 3. Optimal glycemic control | • Reinforce physical activity, appropriate food choices, self blood glucose monitoring<br>• Initiate or adjust medication, if necessary |
| 4. Nutritional therapy | • With deteriorating renal function, restricting dietary protein intake to 0.6 g/kg per day may be useful<br>• Sodium restriction with hypertension may be useful<br>• Fat restriction in the presence of lipid abnormalities and microalbuminuria may be useful |
| 5. Smoking cessation | • Smoking affects renal vasculature and hypertension |
| 6. Assess lipids | • Microalbuminuria can be a marker for dyslipidemia |

### Follow-up for Microalbuminuria Intervention

- Treat hypertension: target BP< 130/80 mmHg.
- Monitor 24 hour urinary protein and creatinine clearance every 6-12 months.
- Monitor serum $K^+$ and creatinine at routine follow-up visits as indicated, for those taking ACE inhibitors or AT II blockers.



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| 6. Assess lipids | • Microalbuminuria can be a marker for dyslipidemia |

### Follow-up for Microalbuminuria Intervention

- Treat hypertension: target BP< 130/80 mmHg.
- Monitor 24 hour urinary protein and creatinine clearance every 6-12 months.
- Monitor serum $K^+$ and creatinine at routine follow-up visits as indicated, for those taking ACE inhibitors or AT II blockers.

## Hypertension and Diabetes

- **Hypertension in adults with diabetes (BP ≥ 140/90 mmHg) should be treated to achieve a target BP < 130/80 mmHg.**

### Choice of Antihypertensive

- For people under 60 years of age and without overt nephropathy, preferred therapy is either an ACE inhibitor or a cardioselective beta blocker.
- For people with overt nephropathy, preferred therapy is an ACE inhibitor.
- Second-line therapy includes low-dose thiazide diuretics, long-acting calcium channel blockers or alpha blockers.
- For people 60 years or older, particularly with systolic hypertension, preferred therapy includes low-dose thiazide diuretics or long-acting calcium channel blockers.

ANTIHYPERTENSIVES

| CLASS | SIDE EFFECTS | EXAMPLES |
|---|---|---|
| ACE Inhibitors | Hyperkalemia<br>Dry cough<br>Increased serum creatinine if renovascular disease is present | Benazepril<br>Captopril<br>Cilazapril<br>Enalapril<br>Fosinopril<br>Lisinopril<br>Perindopril<br>Quinopril<br>Ramipril<br>Trandopril |
| Angiotension II (AT II) Receptor Antagonist | No cough | Valsartin<br>Losartin |
| Calcium Channel Blockers | Flushing<br>Constipation<br>Peripheral edema | Amlodipine<br>Diltiazem SR/CD<br>Felodipine<br>Nifedipine XL/PA |
| Alpha Blockers | Tachycardia<br>Postural hypotension | Prazosin<br>Terazosin |
| Beta Blockers | May mask symptoms of hypoglycemia, increasing need for SBGM | Atenolol<br>Metoprolol |
| Thiazide Diuretics low dose (12.5-25 mg) | Increase in blood glucose usually not significant | Hydrochlorothiazide |

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Manitoba
Care
Recommendations

Neuropathy

# Neuropathy

Manitoba
**Diabetes**
Care Recommendations

## Neuropathy

Diabetic neuropathy can affect the sensory, motor or autonomic nervous system. Neuropathy can be quite disabling, depending on the system involved and the severity of the involvement.

| DIABETIC NEUROPATHY | | |
|---|---|---|
| **CLASSIFICATION** | **DESCRIPTION** | **INTERVENTIONS** |
| **Diffuse Symmetrical Polyneuropathy** | • common presentation is peripheral "numbness and tingling" involving hands and feet<br>• severe presentations have variable types of pain disrupting sleep. Neuropathic pain needs to be distinguished from intermittent claudication | • Amitriptyline<br>• Carbamazepine<br>• Capsaicin topically<br>• Gabapentin<br>**With all therapies, allow 6-8 weeks to see effect.** |
| **Focal Mononeuropathies** | | |
| Cranial | • eg: third nerve palsy with ptosis | • Usually resolves spontaneously |
| Peripheral | • eg: carpal tunnel syndrome<br>• foot drop | • Usually resolves spontaneously |
| Radiculopathy | • Pain in truncal spinal nerve distribution | • Usually resolves spontaneously |
| Diabetic Amyotrophy | • Proximal neuropathy manifested by pain, proximal muscle weakness and muscle atrophy | • Usually resolves spontaneously<br>• May respond to treatment for peripheral neuropathy |

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| DIABETIC NEUROPATHY | | |
|---|---|---|
| **CLASSIFICATION** | **DESCRIPTION** | **INTERVENTIONS** |
| **Automonic Neuropathy** | | |
| Gastrointestinal dysfunction | • Gastroparesis with vomiting/abdominal bloating and pain | • Gastrointestinal motility drugs:<br>Domperidome<br>Metoclopramide<br>Cisapride<br>• Frequent small meals<br>• Consider MDI insulin regimen with Lispro after meals as blood glucose starts to rise |
| | • Diarrhea | • Erythromycin: 2 week course<br>**Avoid concomitant use with Cisapride.** |
| | • Constipation | • Increase water and dietary fibre |
| Genitourinary dysfunction | • Difficulty with micturition<br>• Incontinence or incomplete emptying (neurogenic bladder)<br>• Retrograde ejaculation<br>• Impotence | • Urology referral<br>• Options for erectile dysfunction include Viagra™, vacuum pump, intrapenile prostaglandins, injections or prosthesis |
| Cardiovascular dysfunction | • Postural hypotension<br>• Silent myocardial infarction | • Elastic stockings<br>• Change positions slowly<br>• Fludrocortisone<br>• Additional dietary salt |
| Other | • **Hypoglycemia unawareness** (common) | • Frequent SBGM |
| | • Anhydrosis (lack of sweating, resulting in dry cracked feet in particular) | • Use moisturizers |

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Manitoba
Care
Recommendations

# Complications

Manitoba
**Diabetes**
Care Recommendations

## Foot Complications

### Use of Monofilament

The 10 gram Semmes Weinstein Monofilament is a nylon filament mounted on a holder that has been standardized to deliver a 10 gram force when properly applied. Screening with a monofilament is a validated method to assess for peripheral neuropathy and helps determine the risk of foot ulceration. Monofilament screening is part of the complete foot exam as outlined in the Clinical Assessment section.

The filament should be applied only until it bends slightly across the 5 metatarsal heads on the surface of the foot and the plantar surface of the great toe. The filament should be applied perpendicular to the skin's surface for approximately 1 1/2 seconds duration. Avoid ulcer sites, calluses, scars or necrotic tissue. If 3 out of 6 sites are felt, the person is said to have protective sensation.

RISK CATEGORIES and INTERVENTIONS using the SEMMES WEINSTEIN MONOFILAMENT

| RISK CATEGORY | CLASSIFICATION | INTERVENTIONS |
|---|---|---|
| 0 | • Intact protective sensation | • Low to no risk of foot complications<br>• Education to be provided<br>• Specialized footwear not necessary at this time<br>• Examine feet at each visit or at least every 4-6 months |
| 1 | • Absent protective sensation<br>• Normal foot morphology<br>• No history of ulceration | • Examine feet at each visit or at least four times per year<br>• Appropriately fitted footwear with a soft insole<br>• Education to be provided |
| 2 | • Absent protective sensation<br>• Foot deformity present<br>• Plantar ulceration absent | • Examine feet at each visit or at least four times per year<br>• Appropriately fitted footwear with a suitable insole<br>• Education to be provided |
| 3 | • Absent protective sensation<br>• History of plantar ulcer | • Examine feet at each visit or at least four times per year<br>• Appropriately fitted footwear with a suitable insole (may need custom footwear)<br>• Education to be provided |

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| CLASSIFICATION and INTERVENTION for DIABETIC FOOT ULCERS | | |
|---|---|---|
| **WAGNER'S GRADE** | **CRITERIA** | **INTERVENTIONS** |
| Grade 0 | • Skin intact<br>• No open lesions<br>• May be non-blanching erythema | • Pare callous. Appropriate footwear to protect feet and reduce pressure over pressure points. |
| Grade 1 | • Superficial skin ulceration (may be seen under area of high pressure) | • Pare callous to expose ulcer base. Culture. Saline foot soaks for 10 minutes.<br>• A hydroactive gel (Duoderm™, Intrasite™ or Tegagel™) covered by clean gauze is simplest approach.<br>• Saline wet to dry dressings are an alternative.<br>• May need "wet to dry dressings" using 1/4 strength Eusol bid but once wound is clean and provided that granulation tissue is present, hydroactive gel should be substituted for the Eusol.<br>• Protect wound edges with Vaseline, when using Eusol.<br>• Pressure relief is critical for healing and can be accomplished with appropriate footwear, crutches, wheelchairs and casting.<br>• Infected ulcers need antibiotics. |
| Grade 2 | • Deeper ulceration, associated with infection/cellulitis<br>• Does not extend to bone | • X-ray to determine if bone is involved.<br>• Manage the same as Grade 1 ulcer. Use antibiotics. |
| Grade 3 | • Ulcer has extended to deeper tissue layers such as bone<br>• Has abscess formation or osteomyelitis | • X-ray to determine if bone is involved.<br>• Surgical debridement of infected bone.<br>• Appropriate antibiotics administered.<br>• Use non invasive assessment of peripheral circulation (ankle brachial index). Vascular surgical referral may be indicated. |
| Grade 4 (gangrene) | • Localized gangrene of toes, forefoot, heel | • Manage as for Grade 3 ulcer.<br>• Urgent non invasive assessment of peripheral circulation. Vascular surgical referral may be indicated. |
| Grade 5 (gangrene) | • Gangrene of entire foot | • Urgent assessment as for grade 4 lesions.<br>• Vascular surgical referral. |

| ANTIBIOTIC THERAPY for INFECTED ULCERATIONS | |
|---|---|
| **TYPE OF INFECTION** | **MEDICATIONS** |
| **Mild** | |
| • Usually associated with cellulitis surrounding an ulceration.<br>• May have a small amount of purulent material at base of ulcer. Usually aerobic gram positive cocci.<br>• May treat as outpatient. | • Cloxacillin 500 mg orally (po) qid<br>• Cephalexin 500 mg po qid<br>• Tmp/Smx 1 ds po bid (Trimethoprim/Sulfamethoxazole)<br>• Clindamycin 300 mg po qid<br>• Amoxacillin and Clavulinic Acid 500 mg po tid |
| **Moderate** | |
| • Range from plantar abscess to cellulitis with tissue necrosis.<br>• Use antibiotics effective against staphlococci, streptococci, anaerobes and enterobacteriaceae.<br>• If not toxic, treat with local incision, drainage and antibiotics.<br>• If toxic, use parenteral antibiotic therapy until stable, then switch to oral therapy (manage as per severe infection - see below). | • Tmp/Smx 1 ds po bid and Metronidizole 500 mg po tid<br>• Tmp/Smx 1 ds po bid and Clindamycin 300 mg po qid<br>• Ciprofloxacin 500 mg po bid and Clindamycin 300 mg po qid<br>• Ciprofloxacin 750 mg po bid and Clindamycin 300 mg po qid<br>• Amoxacillin-Clavulinic Acid 500 mg po tid |
| **Severe** | |
| • Limb or life-threatening infections requiring immediate hospitalization and parenteral antibiotic therapy.<br>• Early surgical debridement and drainage of abscesses is critical!<br>• If in doubt as to appropriate treatment, consult with Infectious Diseases Specialist.<br>• When using aminoglycosides, monitor renal function and aminoglycosides blood levels. | • Clindamycin 600 mg IV every 8 hours (Q8h) and Gentamicin 80 mg IV Q8h<br>• Cefoxitin 2 gm IV Q8h<br>• Cefazolin 2 gm IV Q8h and Metronidazole 500 mg IV Q8h<br>• Piperacillin and Tazobactam 3.375 gm IV Q6h<br>• Clindamycin 600 mg IV Q8h and Cefotaxime 1 gm IV Q8h<br>• Imipenem/Cilistatin 500 mg IV Q6h<br>• Meropenem 1 gm IV Q8h |
| **Osteomyelitis** | |
| • Can be managed with long term oral antibiotic therapy with agents that are well absorbed from the gastrointestinal tract and have good distribution to bone and tissue. | • Tmp/Smx 1 ds po bid and Metronidazole 500 mg po tid<br>• Tmp/Smx 1 ds po bid and Clindamycin 300 mg po qid<br>• Levofloxacin 500 mg po bid and Metronidazole 500 mg po tid<br>• Ciprofloxacin 500 mg po bid and Clindamycin 300 mg po qid<br>• Ciprofloxacin 750 mg po bid and Clindamycin 300 mg po qid |

| INTERVENTION for FOOT COMPLICATIONS | |
|---|---|
| **COMPLICATION** | **INTERVENTIONS** |
| • Non blanching erythema over pressure points | • Reduce pressure with appropriate foot wear. |
| • Calluses and corns | • Reduce pressure. Pare carefully. Use pumice stone. Appropriate footwear. |
| • Cutaneous fungal infections | • Clotrimazole cream 1% or Tolnaftate cream 1% or powder applied twice daily. May require antibiotics for superimposed bacterial infection. |
| • Intertrigo | • Keep affected skin areas dry. Use antifungal cream. |
| • Toenail abnormalities | • May be hypertrophic (thick and horn-like). Cut nails every 3-6 weeks straight across to prevent formation of sharp edges. |
| • Paronychia (nail bed infections) | • Twice daily saline solution soaks and adequate nail care. Systemic antibiotics may be necessary. |
| • Cellulitis | • Requires antibiotics. The route of administration (oral vs parenteral) will depend on the severity of the infection. |
| • Claw Foot<br>• Charcot Foot | • Need appropriate footwear and orthotic devices.<br>• For the acute Charcot foot, reduce deformity by removing pressure with immobilizing foot in cast. For an established Charcot foot, appropriate insoles and shoes will be required. |
| • Ischemia | • A painful, cold and white extremity is a surgical emergency (may indicate acute occlusion)! |
| • Intermittent Claudication | • Regular foot care and as much walking as possible to build collateral blood flow. Referral to a vascular surgeon. |

Manitoba
Care
Recommendations

# Dyslipidemia

Manitoba
**Diabetes**
Care Recommendations

## Dyslipidemia

Diabetes significantly increases the risk associated with the complications of atherosclerotic vascular disease, particularly cardiovascular disease. The non-pharmacologic approach of modifying dietary fat intake and increasing physical activity is the first and key step in improving lipid levels. ASA at a dose of 81 mg/day (baby ASA) - 325 mg/day should be given to high cardiovascular risk individuals.

### Risk Factors

- Family history of premature CAD
- Hypertension
- Low HDL (<0.9 mmol/L)
- Age over 30 years

**TARGET LIPID VALUES based on LEVEL of RISK**

| LEVEL OF RISK | TARGET VALUES | | |
|---|---|---|---|
| | LDL mmol/L | TC/HDL ratio | TG mmol/L |
| **Very High Risk** (10-yr risk > 30%) Diabetes with CAD or ≥3 other risk factors | < 2.5 | <4 | <2.0 |
| **High Risk** (10-yr risk 20-30%) Presence of diabetes | < 3.0 | <5 | <2.0 |

**LEGEND:** LDL-low density lipoproteins; HDL-high density lipoproteins; TC-total cholesterol; TG-triglycerides

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| LIPID LOWERING AGENTS | | | |
|---|---|---|---|
| **CLASS** | **ACTION** | **SIDE EFFECTS** | **EXAMPLES** |
| Fibrates | • Lower TG<br>• 10% decrease LDL<br>• 10% increase HDL | • Gastrointestinal<br>• Rare risk of rhabdomyolysis when combined with statins | Bezafibrate<br>Fenofibrate<br>Gemfibrozil |
| HMG CoA Reductase Inhibitors (Statins) | • 25-40% decrease LDL<br>• 5% increase HDL<br>• TG: no effect<br><br>The "newer" statins have TG lowering and HDL increasing effects. | • Rare risk of rhabdomyolysis when combined with fibrates<br>• Elevated liver enzymes may be seen, regular monitoring is recommended | Atorvastatin<br>Fluvastatin<br>Lovastatin<br>Pravastatin<br>Simvastatin |
| Nicotinic Acid | • 30% decrease LDL<br>• 15% increase HDL | • Gastrointestinal<br>• May raise blood glucose levels<br>• Flushing: 325 mg ASA 1 hr before dose | Nicotinic acid |
| Bile Acid Sequestrants | • 15% decrease LDL<br>• No effect HDL<br>• TG may increase | • May raise blood glucose levels<br>• Gastrointestinal<br>• May worsen hyper-triglyceridemia | Cholestyramine<br>Colestipol |

## General Recommendations

- If elevated triglycerides and low HDL, use fibrates.
- If elevated LDL, use HMG CoA reductase inhibitors.
- If mixed (elevated TG and LDL and low HDL), can use HMG CoA reductase inhibitors and fibrates together if single agent therapy has not been effective. The rare risk of rhabdomyolysis should be monitored clinically by the appearance of muscular pain and/or cramps plus biochemical monitoring of creatinine kinase (CK) levels in blood.

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# Acknowledgments

The **Manitoba Diabetes Care Recommendations** document was prepared and produced by the Diabetes and Chronic Diseases Unit of the Public Health Branch of Manitoba Health, in response to the following key Care Working Group recommendation from *Diabetes: A Manitoba Strategy* -

'Develop **Manitoba Diabetes Care Recommendations** for the care of people with diabetes, consistent with the Canadian Diabetes Association Clinical Practice Guidelines.'

The development of the **Manitoba Diabetes Care Recommendations** reflected the same multidisciplinary, intersectoral approach that governed the development of *Diabetes: A Manitoba Strategy.*

To ensure consistency with the Canadian Diabetes Association *1998 clinical practice guidelines for the management of diabetes in Canada*, the Diabetes and Chronic Diseases Unit relied upon the expertise and experience of their advisors - Dr. Heather Dean, pediatric medical advisor and Dr. Sora Ludwig, adult medical advisor. Both have full time academic appointments with the University of Manitoba, in the Section of Endocrinology and Metabolism.

Drs. Ludwig and Dean were extensively involved in the development of the *1998 clinical practice guidelines for the management of diabetes in Canada*. Their experience was incorporated into the development of the **Manitoba Diabetes Care Recommendations.** Dr. Ludwig was a member of the Steering Committee and chaired the Working Group responsible for the *Organization Of Diabetes Care* section. Dr. Dean was a consultant and provided substantial input to the *Diabetes in Children and Adolescents* subsection. Drs. Dean and Ludwig were also part of the national Expert Committee, comprised of people with diabetes, diabetes educators, primary care physicians and diabetes and other medical specialists who reviewed the final document.

Collectively, all members of the Diabetes and Chronic Diseases Unit provided their expertise related to the spectrum of diabetes prevention, education, care, research and support. These individuals include Noella Depew, Kristin Anderson,

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The Diabetes and Chronic Diseases Unit would like to acknowledge the following specific individuals and groups in the development of the **Manitoba Diabetes Care Recommendations**:

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- Dr. Sally Brodrick, Past President, Manitoba Association of Chiropodists
- Ms. Gloria Cameron, Health Coordinator, West Region Tribal Council
- Dr. Eng-Soon Chan, Fellow, Department of Community Medicine, University of Manitoba
- Dr. Martin Colledge, Chiropodist
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- Ms. Laura Sevenhuysen, Education Dietitian, Health Sciences Centre
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Additional consultation and review of the **Manitoba Diabetes Care Recommendations** was provided by the following groups:

- People with diabetes
- Diabetes educators
- Primary care physicians
- Diabetes specialists
- Infectious diseases specialists
- Diabetes foot care specialists
- Nephrologists
- Ophthalmologists
- Optometrists
- Chiropodists and podiatrists
- Geriatric medicine specialists
- Obstetricians and gynecologists
- Community medicine specialists
- Public health professionals and care providers
- Community health care providers.